

Serial No. 09/830,479
Reply to Office Action of April 7, 2004

REMARKS

Status

Claims 1-4, 6 and 10-12 were the subject of the present Office Action. This response does not cancel or add any claims. Accordingly, it is claims 1-4, 6 and 10-12, as presently amended, which are at issue.

The Office Action

In the Office Action mailed April 7, 2004, all claims were rejected. Claims 1-3 and 6 were rejected under 35 U.S.C. §103(a) as being unpatentable over U.S. Patent 5,991,694 of Gudat taken in view of U.S. Patent 6,199,000 of Keller and U.S. Patent 5,955,973 of Anderson.

Claim 4 was rejected under 35 U.S.C. §103(a) as being unpatentable over the '694, '000 and '973 patents as discussed above, taken further in view of U.S. Patent 6,087,984 of Keller.

Claim 10 was rejected under 35 U.S.C. §103(a) as being unpatentable over the '694, '000 and '973 patents as discussed above, taken further in view of U.S. Patent 6,314,348 of Winslow.

Claim 11 was rejected under 35 U.S.C. §103(a) as being unpatentable over the '694, '000 and '973 patents as discussed above and further in view of U.S. Patent 4,967,362 of Schutten.

Claim 12 was rejected under 35 U.S.C. §103(a) as being unpatentable over the '694, '000, '973 and '362 patents as discussed above and further in view of U.S. Patent 6,400,143 of Travostino.

Applicant thanks the Examiner for the search, the Office Action, and the explanation of the basis of the rejections.

The Present Invention

As a background to, and in support of, the discussion of the prior art presented hereinbelow, Applicant will briefly recapitulate the principles of the present invention.

The present invention as specifically claimed is directed to a system for guiding an agricultural vehicle or the like across the surface of the earth. It is a notable feature of the present invention that it operates to guide the vehicle with centimeter-scale accuracy enabling the implementation of extremely precise operations. In particular embodiments, the accuracy achieved by the control system of the present invention exceeds the driving capabilities of a human operator, and in such instances, the system includes servo operated controls allowing it to provide for ultra precise operation of the vehicle.

It is known in the art to utilize GPS based systems for monitoring and controlling the position of a vehicle. While a GPS system can provide ultra precise position data for a stationary object, when such systems are operated in conjunction with a moving vehicle, accuracy is greatly decreased. A GPS system updates its positional data on a periodic basis, and there is a finite time span between each update. Furthermore, owing to transmission irregularities, atmospheric conditions and the like, a receiving station may miss some updates. Since the vehicle is moving, the time span between updates represents a significant source of inaccuracy.

The present invention combines GPS position sensing with a novel inertial navigation system. The inertial navigation system operates on a continuous basis to monitor the position of the vehicle along a path. By integrating GPS and inertial navigation data, a very high degree of positional accuracy is achieved by the present invention. As will be explained hereinbelow, the prior art, taken either singly or in combination, does not show or suggest any position control system for a vehicle which integrates GPS and inertial navigation data in accord with the presently claimed invention.

The Rejection of Claims 1-3 and 6

Claims 1-3 and 6 were rejected under 35 U.S.C. §103(a) as being unpatentable over Gudat '694 in view of Keller '000 and Anderson '973.

The '694 patent shows a vehicular guidance system which utilizes GPS data to determine and control the vehicle's position. In formulating the rejection, the Examiner acknowledges that the '694 patent does not disclose a system which includes any inertial position determining system operating in conjunction with a GPS receiver (see paragraph 3 of the Office Action). However, the Examiner is of the opinion that the '000 patent discloses an inertial position determining system "for generating relative positional data signals applicable to time periods between receipt of vehicle position data . . .", and it would be obvious to incorporate such an inertial position determining system into the system of the '694 patent.

The Examiner further acknowledges that the '694 patent does not disclose any system wherein an initial path is entered by an operator. However, the Examiner cites to the '973 patent for the alleged teaching of a navigation system including this feature.

It is the Examiner's position that one of skill in the art could modify the system of the '694 patent by incorporating the alleged inertial navigation system of the '000 patent and the data entry of the '973 patent therein so as to approximate the present invention. As Applicant will set forth below, this rejection fails on two independent grounds, either of which would be sufficient to mandate reversal of this rejection. First of all, the prior art does not show the inertial position sensing system set forth in the claims of the present invention; therefore, the proposed combination would not approximate the presently claimed invention. Secondly, even if all elements of the present claims were found in the prior art, the Examiner has pointed to no

teaching which would motivate one of skill in the art to combine various of the five cited prior art references in any manner which would approximate the present invention.

(1.) The prior art does not show the claimed elements of the present invention. As discussed above, the present invention is directed to a vehicular navigation system which integrates a GPS position detector with an inertial position sensor. The Examiner has cited to the '000 patent for the alleged teaching of the inertial position sensor. However, Applicant respectfully submits that the '000 patent does not disclose the claimed use of an inertial relative position sensor for determining vehicular position at any time, much less at any time between GPS updates. The system in the '000 patent discloses the use of accelerometers to determine roll, pitch and/or yaw of a vehicle. As such, the system of the '000 patent is an attitude detection system and not a position detection system. In this regard see, for example, column 7, lines 15-18.

The present invention includes a position determining system which generates positional data regarding the travel of the vehicle. By the present amendment, claim 1 has been further amended to clarify that the position determining system generates positional data along a current path. As such, the claims specifically recite an element neither shown nor suggested in the '000 patent. Therefore, any possible combination of the system of the '694 patent with that of the '000 patent will not begin to approximate the presently claimed invention, since that system will not include a GPS position monitor integrated with an inertial position monitor. Therefore, the rejection is improper. Reconsideration and withdrawal thereof is respectfully requested.

(2.) The rejection would be improper even if the '000 patent did show an inertial position monitoring system, since the Examiner has pointed to no teaching in the prior art which would suggest the proposed combination. As discussed above, and as is set forth in the

specification, the present invention provides a vehicular control system which achieves heretofore unobtainable accuracy. The system of the present invention integrates GPS and inertial sensors in a manner which is not shown or suggested in the prior art, and in so doing achieves superior performance in terms of position control. In order to sustain a rejection under 35 U.S.C. §103, the Examiner must point to some motivation in the prior art which would suggest the proposed combination. That has not been done in this case. The Examiner's rejection merely argues that the prior art shows the two separate control systems and that it would be obvious to combine them into one device. Given the absence of any such teaching, and further in view of the superior results obtained by the novel combination of the prior art, this rejection is improper. Reconsideration and withdrawal thereof is respectfully requested.

In summary, Applicant respectfully submits that this rejection is improper since the prior art does not show all of the claimed elements of the present invention; and even if, for sake of argument, it did show such elements, there is no teaching in the prior art which would suggest combining those elements so as to approximate the present invention. Accordingly, claims 1-3 and 6 are patentable over the prior art.

The Rejection of Claim 4

Claim 4 was rejected over the '694, '000 and '973 patents as discussed above, and further in view of the '984 patent of Keller. Claim 4 is dependent on claim 1 and further recites that the control system is operative to direct the vehicle along a path comprising concentric polygons. The Examiner has cited the '984 patent for its showing of a vehicular control system (albeit one different from that of the present invention) which travels in concentric polygons, and is of the opinion that claim 4 is obvious in view of this combination of four prior art references.

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In view of the general inapplicability of the base rejection, Applicant respectfully submits that the rejection of claim 4 is likewise improper. Reconsideration and withdrawal thereof is respectfully requested.

The Rejection of Claim 10

Claim 10 was rejected under 35 U.S.C. §103 over the '694, '000 and '973 patents as discussed above, and further in view of the Winslow '348 patent. Claim 10 depends on claim 1 and recites an apparatus wherein the steering means controller includes at least one solenoid assembly. The '348 patent was cited for a steering controller having a solenoid. Applicant respectfully submits that in view of the general inapplicability of the base reference, this rejection is likewise improper. Reconsideration and withdrawal thereof is respectfully requested.

The Rejection of Claim 11

Claim 11 was rejected under 35 U.S.C. §103 over the '694, '000 and '973 patents, and further in view of the Schutten '362 patent. Claim 11 depends on claim 10 and further limits the steering control system by the inclusion of feedback sensors operative to generate steerage feedback signals. The '362 patent was cited for this teaching. In view of the general inapplicability of the base reference, Applicant respectfully submits that this rejection is improper. Reconsideration and withdrawal thereof is respectfully requested.

The Rejection of Claim 12

Claim 12 was rejected under 35 U.S.C. §103 in view of the '694, '000, '973 and '362 patents and further in view of the Travostino '143 patent. Claim 12 depends on claim 11 and further recites that the steering sensors comprise Hall effect sensors. Applicant respectfully submits that in view of the general inapplicability of the four base references, this rejection based

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upon the fifth reference is likewise improper. Reconsideration and withdrawal thereof is respectfully requested.

Conclusion

In view of the remarks presented herein, and in consideration of the clarifying amendment to the claims, all rejections are overcome. Reconsideration and withdrawal thereof is respectfully requested. The application is in condition for allowance. Any questions, comments or suggestions the Examiner may have which will place the application in still better condition for allowance should be directed to the undersigned attorney.

Respectfully submitted,

Ronald W. Citkowski
Registration No. 31,005
Gifford, Krass, Groh, Sprinkle,
Anderson & Citkowski, P.C.
280 N. Old Woodward Ave., Suite 400
Birmingham, MI 48009-5394
(248) 647-6000

Attorney for Applicant

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